Please replace the paragraph at page 12, line 15 through page 13, line 7, with the following paragraph (marked up version attached in Appendix):

B2

The present invention provides a knurling tool holder which holds a knurl wheel at a prescribed clearance angle and allows infinite adjustment of the angular orientation of the knurl wheel by rotating the knurl wheel about a holder axis "A" that: 1) intersects the point of contact of the knurl wheel and the cylindrical workpiece surface; 2) intersects the longitudinal axis of the cylindrical workpiece; and 3) is perpendicular to the longitudinal axis of the workpiece. The clearance angle β is equal to the compliment of the angle α between the knurl wheel rotational axis C and the holder axis A (i.e., $\beta = 90-\alpha$). As the tool holder rotates the knurl wheel about tool holder axis, there is virtually no change in clearance angle, depth of cut or axial position on the workpiece. Only the helical angle of the generated groove structure is changed. This allows cutting groove structure helical angles from 15° to 165° (where 0° is parallel to the axis 36 of the cylindrical workpiece, and where 90° is perpendicular to the axis of the workpiece thereby providing parallel circumferential groove structures) using a straight tooth cutter (i.e., the teeth are parallel to the rotational axis of the knurl wheel). At angles below 15° approaching 0°, the relative cutting velocites of the workpiece and knurl wheel approaches a pure rolling, or forming, engagement, and may not provide adequate cutting results. Therefore, for groove structure helical angels from 15° to 0°, it is preferable to use a knurl wheel which has negative 30° helical teeth (tooth angle T) and positioning the holder at angles (holder angle H) which are at 45° to 30° to the roll axis. The generated structure helical angle is the arithmetic sum of the holder angle H and the knurl wheel tooth angle T (i.e. 45° - 30° = 15°, 37.8° - 30° = 7.8°, 30° - 30° = 0° and so on). A similar arrangement is used for helical angles from 165° to 180°.

Please replace the paragraph at page 14, line 19 through page 15, line 3, with the following paragraph (marked up version attached in Appendix):

As seen in Figure 5, mounting surface 27 is oriented such that the normal axis C to the mounting surface is not perpendicular to axis 20 of the knurl mount 14. Mounting surface 27 has therein threaded knurl mounting hole 28 surrounded by cylindrical should 27a. Knurl wheel axle 74 is inserted in should 27a. Axle 74 includes first portion 78 which closely fits within shoulder 27a and second portion 76 which rests on mount surface 27. Axle also includes shaft 77 on which knurl wheel 12 is mounted. Mounting hole 28, cylindrical shoulder 27a, and shaft 77 are oriented along normal axis C of the mounting surface 27. Normal axis C intersects longitudinal axis 20 of the knurl mount 14. Normal axis C defines the rotational axis of the knurl wheel 12 when mounted in the knurl mount 14. Normal axis C is oriented at angle α relative to the longitudinal axis 20 of the knurl holder 14. Angle α can be selected in light of the knurl wheel 12 to be used so as to provide the desired clearance angle β where $\beta = 90 - \alpha$. Values for angle α of from 80° to 87° have been found suitable, with 85° preferred for some knurl patterns.

B3

Please replace the paragraph at page 15, line 4 through line 14, with the following paragraph (marked up version attached in appendix):

Figure 6 illustrates the knurl mount 14 of Figure 5 with knurl wheel 12 mounted on shaft 77. Cap 70 fits on top of knurl wheel 12, and screw 72 fits through the cap 70 and shaft 77 and engages in mounting hole 28 in the mount surface 27 of the knurl mount 14. Knurl wheel 12 thus rotates about axis C. Mount surface 27 is located relative to longitudinal axis 20 of the knurl mount such that the forward most portion X of the knurl wheel 12 is on longitudinal axis 20 and extends beyond the front face 19 of mount 14. It is thus seen that the diameter of wheel 12, the thickness of the wheel 12 along axis C, the thickness of first and second portions 76, 78 of axle 74, the position of mount surface 27 relative to the axis 20, and the magnitude of angle α all must be considered in selecting a configuration that places forward-most portion X of the knurl wheel 12 on axis 20.

B4

Please replace the paragraph at page 16, line 18 through line 22, with the following paragraph (marked up version attached in Appendix):

B5

Secured to the rearward facing surface of the gear wheel 52 is a rotating calibrated scale 59. Secured to the mount plage 51 is a matching fixed position calibrated scale 63 (removed from Figure 1 for clarity) that is adjacent to the rotating calibrated scale 59. Preferably, this arrangement has a 360° scale readable with a vernier scale to 6 minutes of arc.

Please replace the paragraph at page 16, line 23 through page 17, line 10, with the following paragraph (marked up version attached in Appendix):

B6

A stopper mount 56 is attached to a side of the mounting plate 51, such as by welding. Plate portion 56a of the stopper mount extends rearward to the forward facing surface of the gear wheel 52. First arm portion 56b of the stopper mount extends rearward beyond the gear wheel 52. Second arm portion 56c of the stopper mount extends in front of and overlaps the rearward facing surface of the gear wheel 52. Set screw 58 is mounted in a threaded hole in the end of the second arm 56c of the stopper mount. A stopper member 57 is attached to the stopper mount 56, such as with bolts 66 and washers 68. Stopper member includes first portion 57a extending rearward beyond the gear wheel, and cantilevered arm portion 57b extending from the portion 57a adjacent to and overlapping the rear facing surface of the gear wheel 52. The cantilevered arm 57b is positioned such that its free end is between the set screw 58 and the face of the gear wheel 52. When the set screw is loosened and disengaged from the cantilevered arm, rotation of handle 55 and worm gear 53 causes the gear wheel 52 to rotate, thereby rotating shaft 41. When the shaft is at the desired rotational orientation, the set screw 58 can be tightened to press the cantilevered arm 57b against the face of the gear wheel, thereby minimizing the chance of unintended rotation of the shaft 41.

Please replace the paragraph at page ~~16~~ 17, line 23 through page 17, line 10, with the following paragraph (marked up version attached in Appendix):

B7

One embodiment of a cut knurling wheel tool 12 is illustrated in Figures 14 and 15. Knurling wheel 12 has a body # which has along its outer working surface a plurality of teeth 44. Each tooth 44 includes a tooth ridge 48 and first and second side surfaces 52. A valley 50 bounded by one side surface 52 from each adjacent tooth 44 is located between each pair of adjacent teeth 44. The body of each wheel 12 also includes opposed major surfaces 42 (only one illustrated). Where the side surfaces 52 of the teeth 44 meet the major surface 42, an edge 46 is formed. For cut knurling, it is preferred that the major surface 42 of the knurling wheel has an undercut 55. Undercut 55 is illustrated as an arcuate surface extending around the full circumference of wheel 12. The undercut provides an improved rake angle when the knurling wheel is engaged with the outer surface of the workpiece. Alternatively, undercut 55 can be flat or any other configuration to provide a zero or positive rake angle. The undercut 55 preferably extends to ridge 48 in one direction, and extends far enough inward from ridge 48 to improve the cutting characteristics of edge 46 and major surface 42, preferably at least as far as tooth valley 50. A positive rake angle provides more efficient cutting than a zero or negative rake angle, and also reduces the amount of burring of the workpiece.

Please replace the paragraph at page ~~19~~ 18, line ~~1~~ 27 through line ~~7~~, with the following paragraph (marked up version attached in Appendix):

B8

One preferred knurling wheel 12' illustrated in Figure 14A, has its tooth configuration varied by cutting different angles $\gamma_1, \gamma_2, \gamma_3, \cdots \gamma_N$ of the valley 50' between teeth 44' on the knurl wheel 12'. At least some of the teeth 44' are preferably asymmetric. For example, a wheel tooth formed between adjacent 90° and 70° valleys would be asymmetric. The peak angles of the ridges formed on the workpiece between grooves are nearly equal to the "valley" angles γ between the teeth on the knurling wheel.
